IMPROVED ELECTROLUMINESCENT DEVICES AND DISPLAYS WITH INTEGRALLY FABRICATED ADDRESS AND LOGIC DEVICES FABRICATED BY PRINTING OR WEAVING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. Patent Application Serial No. 09/218,233, filed 22 December 1998 (now U.S. Patent 6,229,259). The aforementioned related patent application is herein incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This invention is directed toward triode electroluminescent devices, structures and materials comprising carrier injection contacts which are applied to improve or replace organic light emitting diode (LED) fabrication processes and contact materials. More particularly, the invention is directed toward solution deposited and ink-jet printed metal-organic and organic-polymer semiconductors and electroluminescent semiconductors which are used to form panel displays and other photonic devices and products. Alternately, the devices can be fabricated by weaving constituent materials.

Description of the Related Art

[0003] U.S. Patent Nos. 5,656,883 and ~~5,663,559~~ (4,663,552) both to Alton O. Christensen, Sr. (Christensen) disclose true-ohmic contact structures for injecting charge into a vacuum interface, namely, field emission. U.S. Patent No. 5,977,718, U.S. Patent Applications Serial No. 08/281,912 (now U.S. Patent 6,492,966) and U.S. Patent Application Serial No. 09/218,233, all to Christensen, disclose other materials of a true-ohmic contact interface to inorganic, organic and polymer devices. More specifically, U.S. Patent Application Serial No. 09/218,233 discloses woven polymer semiconductors and electroluminescent fibers comprising pixel components and control circuitry. Furthermore, U.S. Patent Application Serial No. 08/281,912 discloses true-ohmic contacts to inorganic and metal-organic materials.

[0004] The status of the prior art in electroluminescent (EL) polymer device design is well documented by the review article by R.H. Friend, *et al.*, in "Electroluminescence in Conjugated Polymers," *NATURE*, Vol.397, 14, January

14. (Original) The method of claim 11 comprising the additional step of printing with an ink jet printer.

15. (Original) The method of claim 11 comprising the additional step of printing within an oxygen free environment.

16. (Original) The method of claim 10 comprising the additional steps of:

(a) forming said EL material and said interconnect metal and said true-ohmic injector contact into fibers;

(b) organizing said fibers in a warp and a woof of a weaving loom; and

(c) weaving said fibers with said loom thereby forming said EL device.

~~17. (Withdrawn) A OMESFET comprising:~~

(a) a substrate;

(b) an organic semiconductor contacting said substrate;

(c) a first true ohmic contact metal contacting said semiconductor and at a first edge of said semiconductor;

(d) a second true ohmic contact metal contacting said semiconductor at a second edge of said semiconductor opposite said first edge; and

(e) a high barrier surround gate contacting said semiconductor between said first true-ohmic contact metal and said second true-ohmic contact metal.

18. (Withdrawn) The OMESFET of claim 17 further comprising:

(a) a source interconnect metal contacting said first true-ohmic contact metal;

(b) a drain interconnect metal contacting said second true-ohmic contact metal; and

(c) a gate interconnect metal contacting said semiconductor and said high ~~barrier surround gate.~~

19. (Withdrawn) The OMESFET of claim 17 wherein said high barrier surround gate is equidistant between said first true-ohmic contact metal and said second true ohmic contact metal.

20. (Withdrawn) The OMESFET of claim 17 wherein said is high barrier surround gate is spaced 3000 nm or less from said first true ohmic contact metal.

21. (Withdrawn) The OMESFET of claim 17 wherein a first portion of said OMESFET is formed by depositing upon said substrate said semiconductor and subsequently printing said first true-ohmic contact metal and said second true-ohmic contact metal and said high barrier surround gate in pattern and sequence required to produce cooperative elements of said OMESFET.

22 (Withdrawn) The OMESFET of claim 21 wherein said source interconnect metal and said gate interconnect metal and said drain interconnect metal are subsequently printed upon said first portion forming a second portion of said OMESFET.

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23. (Withdrawn) The OMESFET of claim 17 wherein said semiconductor and said first true-ohmic contact metal and said second true ohmic contact metal and said high barrier surround gate and said source interconnect metal and said gate interconnect metal and said drain interconnect metal are formed into fibers and said fibers are organized in a warp and a woof of a weaving loom and are woven thereby forming a weave to fabricate said OMESFET.

24. (Withdrawn) The OMESFET of claim 23 wherein said weave is subsequently attached to said substrate.

25. (Withdrawn) The OMESFET of claim 23 wherein said first and said second portions are encapsulated to all components of said OMESFET from oxygen.

26. (Withdrawn) A method for fabricating a OMESFET comprising:

(a) providing a substrate;

(b) affixing a semiconductor to said substrate;

(c) affixing a first true ohmic contact metal to a first edge of said semiconductor;

(d) affixing a second true ohmic contact to a second edge of said semiconductor and opposite said first edge; and

(e) affixing a high barrier surround gate to said semiconductor between said first true-ohmic contact metal and said second true-ohmic contact metal.

27. (Withdrawn) The method of claim 26 further comprising the steps of:

(a) contacting said first true-ohmic contact metal with a source interconnect metal;

(b) contacting said second true-ohmic contact metal with a drain interconnect metal; and

(c) contacting said semiconductor and said high barrier surround gate with a gate interconnect metal.

28. (Withdrawn) The method of claim 26 wherein said is high barrier surround gate is spaced 3000 nm or less from said first true ohmic contact metal.

29. (Withdrawn) The method of claim 26 comprising the additional step of fabricating a first portion of said OMESFET by depositing upon said substrate said semiconductor and said first true-ohmic contact metal and said second true-ohmic contact metal and said high barrier surround gate in pattern and sequence required to produce cooperative elements of said OMESFET.

30. (Withdrawn) The method of claim 29 comprising the additional step of fabricating a second portion of said OMESFET by printing said source interconnect metal and said gate interconnect metal and said drain interconnect metal upon said first portion of said OMESFET in pattern and sequence required to produce cooperative elements of said OMESFET.

31. ~~(Withdrawn) The method of claim 26 comprising the additional steps of:~~

(a) forming said semiconductor and said first true-ohmic contact metal and said second true ohmic contact metal and said high barrier surround gate and said source interconnect metal and said gate interconnect metal and said drain interconnect metal into fibers;

(b) organizing said fibers in a warp and a woof of a weaving loom; and

(c) weaving said fibers with said loom thereby forming a weave to fabricate said OMESFET.

32. (Withdrawn) The method of claim 31 comprising the additional step of affixing said weave to said substrate.

33. ~~(Withdrawn)~~ The method of claim 26 comprising the additional step of ~~encapsulating all components of said OMESFET to exclude oxygen.~~

34. (Original) A video display comprising an EL device and integrally fabricated address and logic devices for controlling said EL device, wherein said EL device comprises:

(a) an EL material;

(b) a interconnect metal contacting said EL material;

(c) A true-ohmic injection contact contacting said EL material and said interconnect metal; and

(d) a hole injection barrier contact which contacts said EL material.

35. (Original) The display of claim 34 wherein said EL device comprises at least one OMESFET comprising:

(a) a substrate;

(b) an organic semiconductor contacting said substrate;

(c) a first true ohmic contact metal contacting said semiconductor and at a first edge of said semiconductor;

42. (Original) The method of claim 39 comprising the additional steps of:

(a) forming semiconductor elements of said display from semiconductor fibers, and forming insulating elements of said display from insulating fibers, and forming metal conducting elements of said display from conducting fibers;

(b) organizing said semiconducting fibers and said conducting fibers and said insulating fibers in a warp and a woof of a weaving loom; and

(c) weaving said semiconducting fibers and said conducting fibers and said insulating fibers in said loom to produce said video display.

43. (Original) The method of claim 40 wherein said EL device comprises three pairs of red, blue and green emitting OMESFETs.

~~44. (Withdrawn) The OMESFET of claim 17 wherein said high barrier surround gate~~ is positioned at a distance from said first true-ohmic contact metal to tune carrier balance.

45. (Withdrawn) ~~The~~ method of claim 26 comprising the additional step of tuning carrier balance by varying distance between said high barrier surround gate and said ~~first true-ohmic contact metal.~~